Astrophysics Research And Analysis

Quasi-Optical Filter Development and Characterization forFar-IR Astronomical Applications

Completed Technology Project (2015 - 2017)

Project Introduction

Mid-infrared through microwave filters, beamsplitters, and polarizers are a crucial supporting technology for NASA's space astronomy, astrophysics, and earth science programs. Building upon our successful production of mid-infrared, far-infrared, millimeter, and microwave bandpass and lowpass filters, we propose to investigate aspects of their optical performance that are still not well understood and have yet to be addressed by other researchers. Specifically, we wish to understand and mitigate unexplained high-frequency leaks found to degrade or invalidate spectroscopic data from flight instruments such as Herschel/PACS, SHARC II, GISMO, and ACT, but not predicted by numerical simulations. A complete understanding will improve accuracy and sensitivity, and will enable the mass and volume of cryogenic baffling to be appropriately matched to the physically achievable quasioptical filter response, thereby reducing the cost of future far-infrared missions. The development and experimental validation of this modeling capability will enable optimization of system performance as well as reduce risks to the schedule and end science products for all future space and suborbital missions that use quasioptical filters. The outcome of this work will be critical in achieving the exacting background-limited bolometric detector performance specifications of future far-infrared and submillimeter space instruments. This program will allow us to apply our unique in-house numerical simulation software and develop enhanced layer alignment, filter fabrication, and testing techniques for the first time to address these issues: (1) enhance filter performance, (2) simplify the optical architecture of future instruments by improving our understanding of high-frequency leaks, and (3) produce filters which minimize or eliminate these important effects. With our state-of-the-art modeling, fabrication, and testing facilities and expertise, established in previous projects, we are uniquely positioned to tackle this development.

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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Astrophysics Research and Analysis

Quasi-Optical Filter Development and Characterization forFar-IR Astronomical Applications

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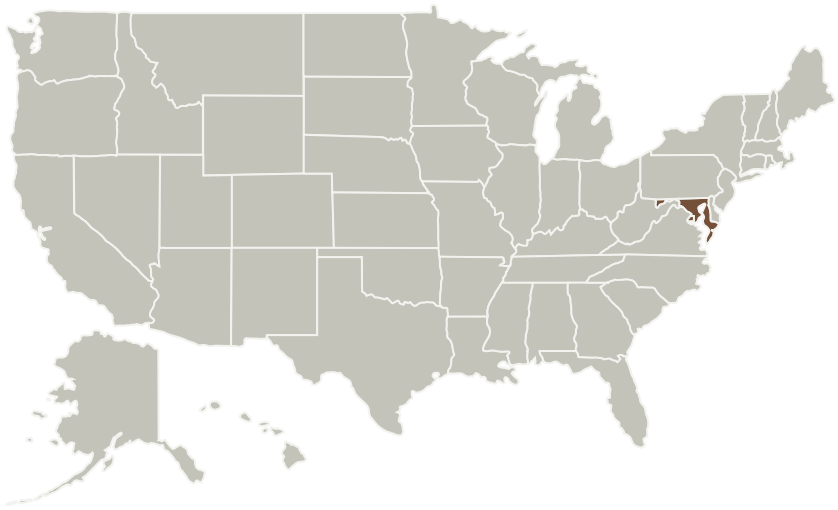
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Naval Research Laboratory(NRL)	Supporting Organization	US Government	Washington, District of Columbia

Primary U.S. Work Locations	
District of Columbia	Maryland

Project Management

Program Director:

Michael A Garcia

Program Manager:

Dominic J Benford

Principal Investigator:

Kenneth P Stewart

Co-Investigators:

Samuel H Moseley
Edward J Wollack
Jacqueline Fischer
Ari D Brown

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destination

Outside the Solar System